REMARKS

Reconsideration of this application, as amended, is respectfully requested.

Claims 1-56 are pending. Claims 1-56 stand rejected.

Claims 1, 3, 4, 5, 7, 8, 9, 10, 16, 17, 21, 22, 23, 25, and 27 have been amended. Claims 2, 6, 20, 24, 30, 34, 48 and 52 have been cancelled. No claims have been added. Support for the amendments is found in the specification, the drawings, and in the claims as originally filed. Applicants submit that the amendments do not add new matter.

Drawings

The drawings are objected to because they contain hand drawn labels and figures.

Applicants submit replacement sheets for Figures 1-15 in compliance with 37 CFR 1.127(d).

Rejections Under 35 U.S.C. § 112

The Examiner has rejected claim 27 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. The Examiner has stated that

> Claim 27 recites the limitation "micro-voids" in line 2. There is insufficient antecedent basis for this limitation in the claim. For the purpose of examination, it will be assumed that claim 27 should depend from claim 26.

(p. 3, Office Action 022405)

Applicants have amended claim 27 to be dependent from claim 26 to overcome the Examiner's rejection under 35 U.S.C. § 112, second paragraph.

Rejections Under 35 U.S.C. § 102(e)

Claims 1, 2, 5-8, 19, 20, 23-25, and 28-56 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,290,804 of Henley et al. ("Henley").

Applicants have amended claim 1 to indicate that effecting laser-induced cleaving of a substrate is performed by at least one of the following:

stoichiometrically designing a composition of a material to form a cleave layer in the substrate to match a bond breaking energy involving the material, to a laser energy characterized by a laser wavelength; and

selecting the laser wavelength to provide the laser energy to substantially match a bond-breaking threshold energy of the material, based upon at least a stoichiometric composition of the material of the cleave layer.

Dependent claims 3-5, and 7-8 have been amended respectively to depend from amended claim 1.

Henley discloses cleaving by subjecting a substrate with a sequence of laser pulses from a single laser source, wherein the laser pulses have sufficient amplitudes ("energy levels") (Figure 8, Col. 7 Lines 14-21), to initiate cleaving and sustain a cleave front (col. 3, lines 34-56). More specifically, Henley discloses

> The cleave front formation energy (E_t) must often be made lower than the bulk material fracture energy (E_{mat}) at each region to avoid shattering or cracking the material. The directional energy impulse vector in diamond cutting or the scribe line in glass cutting are, for example, the means in which the cleave energy is reduced to allow the controlled creation and propagation of a cleave front. The cleave front is in itself a higher stress region and once created, its propagation requires a lower energy to further cleave the material from this initial region of fracture. The energy required to propagate the cleave front is called the cleave front propagation energy (E_p). The relationship can be expressed as:
>
> $E_c = E_p$ +[cleave front stress energy]
>
> A controlled cleaving process is realized by reducing E_p along a favored direction(s) above all others and limiting the available energy to be below the E_p of other undesired directions. In any cleave process, a better cleave surface finish occurs when the cleave

process occurs through only one expanding cleave front, although multiple cleave fronts do work.

(Henley, col. 3 Lines 34-56) (emphasis added)

Thus, Henley, discloses cleaving a material with a sequence of laser pulses by selecting amplitudes ("energy levels") to fracture the material (Figure 8), and not by selecting the laser wavelength to provide the laser energy to substantially match a bond-breaking threshold energy of the material, as claimed by Applicants. Significantly, Henley merely discloses cleaving the material by laser pulses having sufficient amplitudes ("energy levels") that propagate along a direction having lower bond breaking energy than other directions, and not cleaving the material by stoichiometrically designing a composition of a material to match a bond breaking energy of the material to a laser energy characterized by a laser wavelength, nor by selecting the laser wavelength to provide the laser energy to substantially match a bond-breaking threshold energy of the material, based upon at least a stoichiometric composition of the material of the cleave layer, as recited in amended claim 1. Accordingly, Henley fails to disclose, teach, or suggest such limitation of amended claim 1.

Because Henley does not set forth all the limitations of amended claim 1, Applicants respectfully submit that amended claim 1 is not anticipated by Henley under 35 U.S.C. § 102(e).

Given that claims 3-5, 7-8, 19, and 21-27 depend directly or indirectly from amended claim 1, and add additional limitations, Applicants respectfully submit that claims 3-5, 7-8, 19, and 21-27 are likewise not anticipated by Henley under 35 U.S.C. § 102(e).

Because claims 29, 31-33, 35-36, 38-47, 49-51, and 53-56 contain at least the same limitation as discussed above with respect to amended claim 1, Applicants respectfully submit that claims 29, 31-33, 35-36, 38-47, 49-51, and 53-56 are likewise not anticipated by Henley under 35 U.S.C. § 102(e).

Applicants have amended dependent claim 9 to convert it into independent claim.

Amended independent claim 9 reads as follows.

> A method comprising:
> effecting laser-induced cleaving of a substrate by using simultaneous application of a plurality of interfering laser beams to effect a laser energy to effect the laser-induced cleaving substantially along a laser-defined cleave plane.

(Amended claim 9) (emphasis added)

The Examiner acknowledged that Henley fails to disclose "plural interfering laser beams" to perform cleaving (p. 7, Office Action 02/24/05). Additionally, Henley fails to disclose using simultaneous application of a plurality of interfering laser beams to the substrate to effect a laser energy to effect the laser-induced cleaving substantially along a laser-defined cleave plane, as recited in amended claim 9.

Because Henley does not set forth such limitation of amended claim 9, Applicants respectfully submit that amended claim 9 is not anticipated by Henley under 35 U.S.C. § 102(e).

Because claim 37 contains at least the same limitation as discussed above with respect to amended claim 9, Applicants respectfully submit that claim 37 is likewise not anticipated by Henley under 35 U.S.C. § 102(e).

The Examiner, however, cites US Patent 6, 653,210 of Choo et al. ("Choo") for teaching such limitation contending that Choo "teaches a multiple laser cleaving method with tuned energies that form an profile to the depth of the desired cleave plane" (p. 7, Office Action 02/24/05). Applicants respectfully disagree. In fact, Choo discloses two separate laser beams, with two different wavelengths to produce two laser spots of different intensities and sizes (col 6, lines 5-10), and not simultaneous application of a plurality of interfering laser beams as claimed by Applicants. Significantly, Choo discloses first scanning a first laser, which forms a scribe line, and then scanning a second laser along the scribe line drawn by the first laser(col. 8, lines 38-48). As such, Choo, similarly to Henley, fails to disclose, teach, or suggest using simultaneous application of a plurality of interfering laser beams to the substrate to effect a laser energy to effect the laser-induced cleaving substantially along a laser-defined cleave plane, as recited in

amended claim 9. Choo reference is further discussed in the remarks' section with regard to rejections under 35 U.S.C. § 103(a).

Rejections Under 35 U.S.C. § 103(a)

Claims 3, 4, 21, and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,290,804 of Henley et al. ("Henley") in view of U.S. Patent Application No. 2003/0162367 of Roche ("Roche"). Claims 9-12 and 15-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,290,804 of Henley et al. ("Henley") in view of U.S. Patent No. 6,653,210 of Choo et al. ("Choo"). Claims 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,290,804 of Henley et al. ("Henley") in view of U.S. Patent No. 6,653,210 of Choo et al. ("Choo") in further view of U.S. Patent Application No. 2003/0162367 of Roche ("Roche"). Claims 26 and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,290,804 of Henley et al. ("Henley") in view of U.S. Patent Application No. 2003/0153162 of Nakano et al. ("Nakano").

The Examiner has rejected claims 3, 4, 21 and 22 under 35 U.S.C. § 103 as being unpatentable over Henley in view of Roche.

As set forth above, Henley fails to disclose, teach, or suggest the limitation of amended claim 1 of stoichiometrically designing a composition of a material to form a cleave layer in the substrate to match a bond breaking energy involving the material, to a laser energy defined by a laser wavelength.

Roche discloses cutting a thin layer from a substrate using short laser pulses absorbed in a weakened zone of the substrate. Importantly, Roche discloses

> Given that silicon is rather transparent at the YAG wavelength, it is possible to reach the layer 7 in the center of the stack 2, 4 by illuminating either face 13 or the opposite face of the structure. Advantage is taken of the implanted layer being naturally much more highly absorbent than the initial crystal, even when implantation is performed using

protons. It is also possible to increase its absorption strongly by implanting ions of phosphorus or of arsenic or of any other suitable element.

(Roche, [0065])

Roche merely discloses implanting ions of phosphorus or arsenic in the weakened zone to increase absorption of the 1um laser light in the weakened zone, and not designing a stoichiometric composition of a material that matches a bond breaking energy of the material to a laser energy characterized by a wavelength, and nor selecting the laser wavelength to provide the laser energy to substantially match a bond-breaking threshold energy of the material, based upon at least a stoichiometric composition of the material of the cleave layer, as recited in amended claim 1. As such, Roche, similarly to Henley, fails to disclose, teach, or suggest such limitation of amended claim 1.

Consequently, even if Henley and Roche were combined, such a combination would lack such limitation of amended claim 1.

Therefore, Applicants respectfully submit that amended claim 1 is not obvious under 35 U.S.C. § 103 (a) over Henley in view of Roche.

Given that claims 3, 4, 21, and 22 depend, directly or indirectly, from amended claim 1, and add additional limitations, Applicants respectfully submit that claims 3, 4, 21, and 22 are likewise not obvious under 35 U.S.C. § 103 (a) over Henley in view of Roche.

The Examiner has rejected claims 9-12 and 15-18 under 35 U.S.C. § 103 as being unpatentable over Henley in view of Choo.

With respect to independent amended claim 9, as set forth above, neither Henley, nor Choo discloses, teaches, or suggests the limitation of amended claim 9 of using simultaneous

application of a plurality of interfering laser beams to the substrate to effect a laser energy to effect the laser-induced cleaving substantially along a laser-defined cleave plane.

Consequently, even if Henley and Choo were combined, such a combination would lack such limitation of amended claim 9.

Therefore, Applicants respectfully submit that amended claim 9 is not obvious under 35 U.S.C. § 103 (a) over Henley in view of Choo.

Given that claims 10-12 and 15-18 depend, directly or indirectly, from amended claim 9, and add additional limitations, Applicants respectfully submit that claims 10-12 and 15-18 are likewise not obvious under 35 U.S.C. § 103 (a) over Henley in view of Choo.

The Examiner has rejected claims 13 and 14 under 35 U.S.C. § 103 as being unpatentable over Henley in view of Choo and further in view of Roche.

As set forth above, neither Henley, nor Choo discloses, teaches, or suggests the limitation of amended claim 9 of using simultaneous application of a plurality of interfering laser beams to the substrate to effect a laser energy to effect the laser-induced cleaving substantially along a laser-defined cleave plane.

Roche as set forth above, discloses cutting a thin layer from a substrate using short pulses from a single laser source, and similarly to Henley and Choo, fails to disclose, teach, or suggest such limitation of amended claim 9.

Given that claims 13 and 14 depend from amended claim 9, and add additional limitations, Applicants respectfully submit that claims 13 and 14 are likewise not obvious under 35 U.S.C. § 103 (a) over Henley in view of Choo, and further in view of Roche.

The Examiner has rejected claims 26 and 27 under 35 U.S.C. § 103 as being unpatentable over Henley in view of Nakano

With respect to amended claim 1, Nakano discloses a delamination ("cleaving") of a bonded wafer at a micro bubble layer by heat treatment (e.g., [0066], [0075]), and not by a laser energy, as claimed. Accordingly, Nakano, similarly to Henley, fails to disclose, teach, or suggest the limitation of amended claim 1 of stoichiometrically designing a composition of a material to form a cleave layer in the substrate to match a bond breaking energy involving the material to a laser energy characterized by a laser wavelength.

Consequently, even if Henley and Nakano were combined, such a combination would lack such limitation of amended claim 1.

Therefore, Applicants respectfully submit that amended claim 1 is not obvious under 35 U.S.C. § 103 (a) over Henley in view of Nakano.

Given that claims 26 and 27 depend from amended claim 1, and add additional limitations, Applicants respectfully submit that claims 26 and 27 are likewise not obvious under 35 U.S.C. § 103 (a) over Henley in view of Nakano.

It is respectfully submitted that in view of the amendments and arguments set forth herein, the applicable rejections and objections have been overcome. If there are any additional charges, please charge Deposit Account No. 02-2666 for any fee deficiency that may be due.

Respectfully submitted,

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DRAWINGS

Please replace the drawing sheets for Figures 1-15, with the attached replacement sheets of drawings.